

## 6.0 ATTAINMENT DEMONSTRATION

The Code of Federal Regulations, 40 CFR 51.112(a), states that each attainment plan must demonstrate that the measures, rules, and regulations contained in it are adequate to provide for the timely attainment and maintenance of the national standard that it implements. The adequacy of the selected control strategy to attain the NAAQS must be demonstrated by means of a dispersion model or other procedure which is shown to be adequate and appropriate for the purpose.

40 CFR 51.112(b) requires that the demonstration of attainment include a summary of the computations, assumptions, and judgements used to determine the degree of reduction of emissions (or reductions in the growth of emissions) that will result from implementation of the control strategy. It also requires a presentation of emission levels and air quality levels expected to result from implementation of each control measure and the overall control strategy, respectively, and it requires a description of the dispersion models used to project air quality and to evaluate control strategies.

Except for a discussion of the rationale for the emission reduction factors used in the attainment plan, all of the above-listed information that is required to demonstrate adequacy of the Spokane PM<sub>10</sub> emissions control strategy is presented in Appendix K. This section summarizes that information and provides a rationale for the emission reduction factors used in the plan.

### 6.1 SUMMARY OF COMPUTATIONS, ASSUMPTIONS, AND JUDGEMENTS

This section summarizes the computations, assumptions, and judgements used to determine the degree of reduction in emissions, and/or in the growth of emissions, that will result from implementation of the control strategy. The most basic computations, etc., are that the adopted controls will achieve the following emission reductions, or control efficiencies, when applied to the sources specified:

<u>Source</u>	<u>Control Efficiency</u>
Unpaved Roads	90-100% (in most cases)
Paved Roads	70%
Residential Wood Combustion	80%

These emission reduction factors (credits), or control efficiencies, are based on the computations, assumptions, and judgements of the U.S. Environmental Protection Agency, the Washington State Department of Ecology, and other agencies having experience with similar control mechanisms in other areas of the country, as referenced below. Also, these factors are only being applied to the emissions in each category that are being reduced by the particular control measures being implemented. They are not being applied to all of the emissions in that category. (For instance, an emission reduction factor of 90-100% has only been applied to the unpaved road segments that were paved or oiled between December 31, 1990 and December 10, 1993 or will be paved or oiled beginning in 1994.) The specific

conditions under which the emission reduction factors have been applied are described in Appendix K.

### 6.1.1 Unpaved Roads:

The emission reduction factors for paving or oiling unpaved roads vary depending upon the type of road being paved or oiled, including its level of silt loading, and they are derived by comparing the emission factors for the roads before and after paving or oiling as shown in EPA's Compilation of Air Pollutant Emission Factors (AP-42), and in the Spokane PM<sub>10</sub> emission inventory provided in Appendix H. Table 6.1 shows the emission factors used in the WYNDvalley model for each, which are based in part on Ecology's 1992 silt loading study. The results of that study are presented in Appendix K.

**Table 6.1**  
**Paved and Unpaved Road Emission Factors**

<u>Type of Road</u>	<u>Emission Factor</u> in kg/VKT <sup>1</sup>	<u>% Reduction</u> (From a Dirt Road)
Native Road	0.59	0%
Dirt Road	0.59	0%
Unimproved road	0.59	0%
Unpaved Road	0.25	6%
Gravel Road	0.10	8%
Oiled Native Road	0.059	90%
Oiled Dirt Road	0.059	90%
Oiled Unimproved road	0.059	90%
Oiled Unpaved Road	0.025	96%
Oiled Gravel Road	0.010	98%
Paved Road <150 ADT <sup>2</sup>	0.0046	99%
Paved Road 150-900 ADT <sup>2</sup>	0.0040	99%
Paved Road 900-2150 ADT <sup>2</sup>	0.0023	100%
Paved Road 2150-3500 ADT <sup>2</sup>	0.0011	100%
Paved Road 3500-5000 ADT <sup>2</sup>	0.00063	100%
Paved Road 5000-6200 ADT <sup>2</sup>	0.00036	100%
Paved Road >6200 ADT <sup>2</sup>	0.00031	100%

<sup>1</sup> kilograms per vehicle kilometer travelled.

<sup>2</sup> average daily traffic

In order to derive the emission reduction factors, or control efficiencies, for particular segments of road paving or oiling, it is necessary to subtract the after-control emission factor from the pre-control emission factor and divide by the pre-control emission factor. For example, in a typical case where a dirt road with an average daily traffic load of <150 vehicles is being paved, the emission reduction factor, or control efficiency (CE), is computed as follows:

$$CE = \frac{0.59 - 0.0046}{0.59}$$

$$CE = .99 \text{ (99\%)}$$

Except in those limited cases where some oiled unpaved or oiled gravel roads with low traffic counts have been paved, these computations show a control efficiency of 90-100%. The 90-98% control efficiency for oiling, however, is based on an assumption there will be sufficient oiling, and three oilings per year occurring on a schedule such as the following may be necessary:

First Treatment	August 15
Second Treatment	September 7
Third Treatment	October 1

#### **6.1.2 Paved Roads:**

The emission reduction factor of 70% on paved roads is based primarily on the policy set forth in City of Spokane Resolution #93-43 and on SCAPCA's regulation for the control of particulate matter from paved surfaces, which is intended to implement the City policy as well as control emissions on state and county roads. A copy of Resolution #93-43 is found in Addendum 3 to Appendix I, and SCAPCA's regulation is included in Section 6.14 of their Regulation I, which is found in Addendum 1 to Appendix I. (The 70% emission reduction factor is also consistent with the 71% allowed for a similar paved roads control program in Lincoln County, Montana.)

Resolution #93-43 indicates that the City will reduce the use of traction material by 50% and increase the amount of spring, summer, and fall street sweeping from 2 to 6 times per year on arterials, and from 1 to 3 times per year on residential streets. It also indicates that the city will sweep major arterials whenever weather conditions permit, discontinue any sweeping during period of inversion, and apply dust palliative to major arterials as conditions merit.

SCAPCA's regulation requires that all affected governmental entities submit emission reduction and control plans to SCAPCA for approval which will jointly achieve and maintain at least a 70% reduction, from the 1992-1993 base season, in the 24-hour  $PM_{10}$  emissions from paved surfaces. Although this provision does not specify the amount of control to be achieved by any particular means described in the regulation, an overall 70% reduction in emissions must be achieved through implementation of the approved plans (copies of which are included in Addendum 4 to Appendix I along with some baseline reports).

In reviewing the plans, SCAPCA concluded that they would achieve the required 70% reduction in emissions from paved roads. This is based on the fact that the plans jointly show that there will be 70% less particulate matter on paved roads which will be susceptible to emission after the snowfall season when the roads thaw and dry out and receive vehicle traffic under stagnant air conditions, which is

usually in February and March. This is achieved by increasing the amount of deicer and reducing the amount of sanding material used, by cleaning up any particulate matter before it becomes susceptible to emission, and/or by applying a dust suppressant to any remaining particulate matter prior to a potential emission period.

In effect the combination of plans show a 40-50% reduction in the amount of sanding material to be used. This will be achieved by using de-icers and more snowplowing, by sanding fewer streets, and/or by using a lower sanding material application rate), and they are expected to show a 30-40% increase in the amount of material that will be swept up or made unsuceptible to emission before any potential emission period. This will be achieved by sweeping between snow storms, by cleaning up sooner after the snowstorm season, by targeting the priority roadways for cleanup first, by increasing the number of sweepers deployed in any cleanup event, by having the sweepers operate longer or more thoroughly during cleanup, and/or by applying a dust palliative, or suppressant, and avoiding sweeping before and during periods of inversion.

### **6.1.3 Residential Wood Combustion:**

The emission reduction factor of 80% on residential wood combustion emissions during periods of curtailment is based on various indicators of effectiveness, both in Spokane and in other areas with similar curtailment programs. (The Spokane curtailment program is described in detail in Section 5.5.3 and Appendix I of this attainment plan.)

First of all, there are the results of the June 1990 Bonneville Power Administration study, Evaluating Effects of Wood Smoke Control Legislation in Washington State on Electrical Customers, which was conducted by Mike Nelson of the Washington State Energy Office and Stewart Kaufman of the Gilmore Research Group. (A copy of this study is contained in the November 1991 Thurston County PM<sub>10</sub> attainment plan which is part of the Washington State Implementation Plan.) According to this study, 100% of the wood burners surveyed were aware of burn bans (86% because of television), and 80% complied with all burn bans, compared to 69% on a statewide basis.

Another indicator of the effectiveness of Spokane's wood smoke curtailment program is found in the number of exceedances of the 24-hour standard that have occurred since 1985 during the months of December through February when the residential wood combustion scenario occurs, and there is a propensity for exceedances caused by residential wood combustion emissions. Table 6.2 shows the number of observed and estimated exceedances that have occurred at the Country Homes and Nazarene monitoring sites during these months since 1985. (The Country Homes and Nazarene monitoring sites are located in the area of Spokane that has the highest residential wood combustion emissions.) Table 6.3 shows the number of observed exceedances that have occurred at all monitoring sites in the Spokane area during the months of December through February since 1985.

**Table 6.2**  
**EXCEEDANCES AT THE COUNTRY HOMES / NAZARENE MONITORING SITES**  
**BETWEEN DECEMBER AND FEBRUARY SINCE 1985**

	<u>OBSERVED</u>	<u>ESTIMATED</u>
1985:	1	8.45
1986:	2	12.00
1987:	2	12.00
1988:	0	0
1989:	0	0
1990:	0	0
1991:	0	0
1992:	0	0
1993:	0	0

**Table 6.3**  
**EXCEEDANCES AT ALL MONITORING SITES BETWEEN DECEMBER AND**  
**FEBRUARY SINCE 1985**

	<u>OBSERVED</u>
1985:	9
1986:	5
1987:	2
1988:	5
1989:	3
1990:	1
1991:	0
1992:	0
1993:	0

As indicated by this data, there have been no exceedances in the Country Homes/Nazarene area during the months of December through February since 1987 when Washington State adopted its wood smoke control law and since 1988 when SCAPCA adopted its solid fuel burning device regulation which imposes mandatory curtailments during periods of impaired air quality. Furthermore, there have been no December to February exceedances at any other monitoring sites in the nonattainment area since 1990. (Based on the modelling that has been done, it appears that the exceedances that occurred at all monitoring sites between December and February in the years 1988 through 1990 were caused primarily by paved road emissions associated with traction materials.)

## **6.2 MODELS USED**

Two different dispersion models were used to project air quality, evaluate the Spokane PM<sub>10</sub> emissions control strategy, and ultimately demonstrate attainment of the 24-hour PM<sub>10</sub> standard. A dispersion model is a mathematical or physical representation of an airshed that can simulate existing conditions with respect to the dispersion of air pollutants and can predict the effects of any changes in

conditions or factors that affect dispersion. Such factors include emissions, weather, population growth, vehicular traffic, terrain features, and control measures, which (together with air quality data) serve as "inputs" to the model. Today most dispersion models are complex computer programs that incorporate many factors which are known to affect air pollution.

In order to determine whether a model can effectively simulate real conditions, it must first be validated. Validation involves running a model with data for a representative historical period with known results to see whether the model successfully predicts those results, and making only those changes that actually account for any discrepancies. If validation proves that the model can effectively predict known results, it is assumed that it will predict unknown results for any period in the future with a hypothetical mix of conditions.

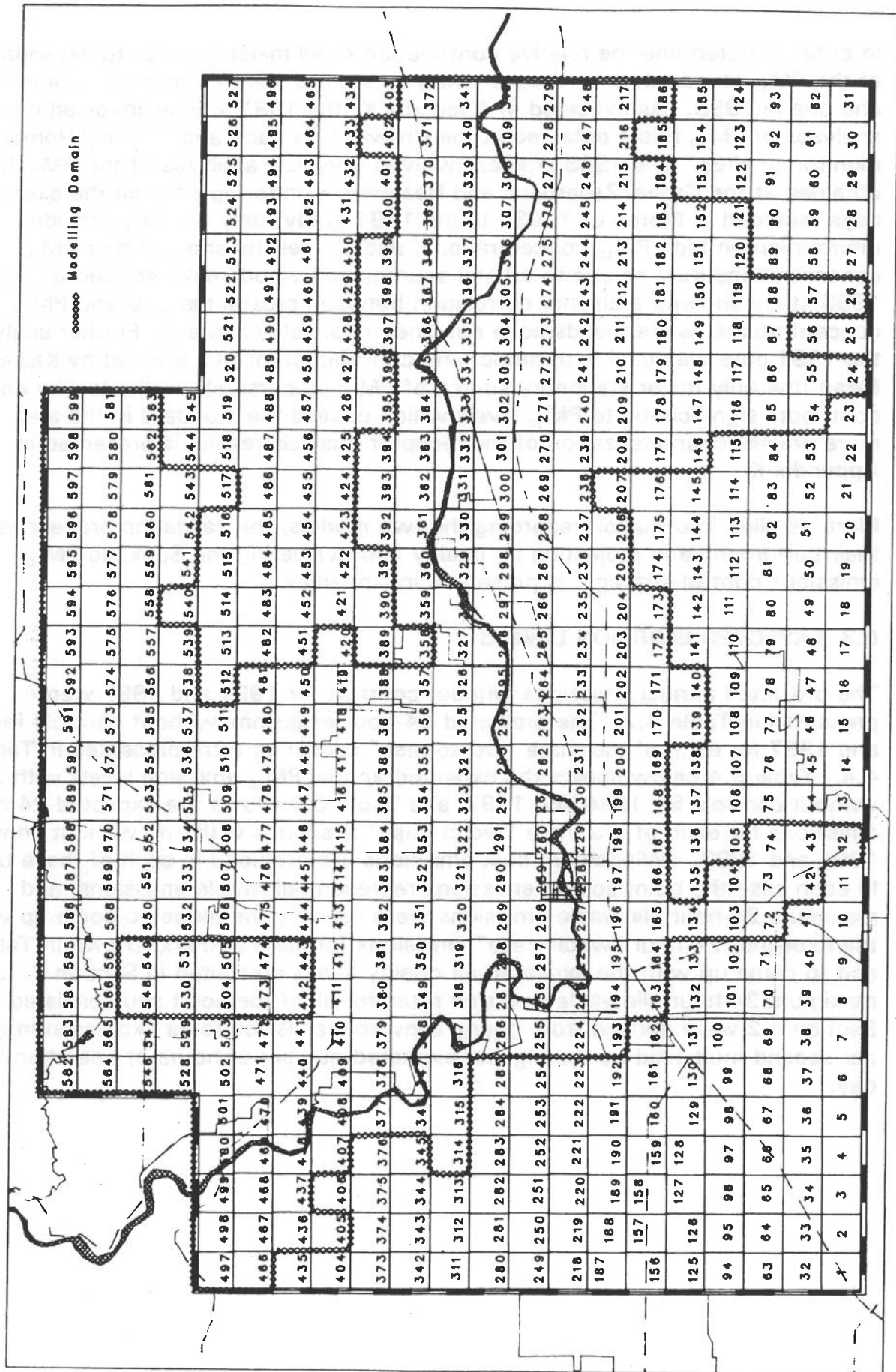
The two dispersion models that were used in the demonstration of attainment include WYNDvalley 3.11, an Eulerian grid model, and a second generation Industrial Source Complex model (ISC<sup>2</sup> 93109), a classical Guassian dispersion model. WYNDvalley was used to model area sources, and the ISC<sup>2</sup> model was used to model point sources.

The WYNDvalley model was selected for area sources because it can effectively simulate conditions in Spokane where many of the days with high PM<sub>10</sub> concentrations have more than six hours of reportedly calm winds and most occur during winter when the pollutant mixing depth is expected to remain below the surrounding terrain. In addition the model can cope with the existence of complex boundaries in the modelling domain. Figure 6.1 shows the modelling domain used in the WYNDvalley model for Spokane with the grid cell numbers identified.

The ISC<sup>2</sup> model (known as an ISCST model, or "short term" Industrial Source Complex model) was selected for point sources because it can effectively compute the impact of point source emissions on the ambient concentration. It uses stack emission parameters to compute the rise of buoyant plumes, building dimensions to compute the wake and cavity effects of air flow past structures as it affects material emitted from sources, and hourly meteorological and astronomical data to compute the dispersion and advection of the emitted material. In accordance with EPA guidance, maximum 24-hour allowable emissions were used in modelling the point sources as explained in Sections 4.2 and 6.3.

In order to prove that the two models were adequate and appropriate for use in projecting air quality and evaluating the Spokane PM<sub>10</sub> emissions control strategy, the two model outputs were combined and properly validated. Validation, among other things, involved comparing the model-predicted PM<sub>10</sub> concentration for each day modelled with the observed concentration for the same day at each monitoring site. (As mentioned later, and in Appendix K, 58 days between November of 1985 and the end of 1989 were modelled, each with a PM<sub>10</sub> concentration of 120 ug/m<sup>3</sup> or greater.) After making a few changes, especially to account for the affects of precipitation and other sources of moisture, the models performed well.

Figure 6.1  
Spokane PM10 Nonattainment Area Showing The  
WYNDvalley Modelling Domain with Grid Cell Numbers



In order to determine the relative contribution of all major sources to exceedances of the PM<sub>10</sub> standard, two receptor analysis studies were conducted, one in 1991 and one in 1993. As indicated in Appendix K, the 1991 studies involved chemical analyses of PM<sub>10</sub> filters obtained at the Crown Zellerbach and Country Homes monitoring sites. The 1993 studies involved chemical analyses of the PM<sub>10</sub> filters obtained at the Crown Zellerbach and Nazarene monitoring sites on the exceedance days recorded in March of 1993. In the 1991 study, only one day provided information on high PM<sub>10</sub> concentrations, and the results showed that PM<sub>10</sub> concentrations may be due to crustal sources and woodsmoke emissions. The 1993 study showed a distinct correlation between crustal material and PM<sub>10</sub> concentrations, while woodsmoke remained relatively constant. Further analysis of the 1991 data was unable to detect any contribution of SO<sub>2</sub> emitted by Kaiser Mead (the only major stationary source of PM<sub>10</sub> precursors), so the facility does not contribute significantly to PM<sub>10</sub> levels which exceed the standard in the area. A more precise characterization of the receptor analysis results is presented in Appendix K.

More detailed information regarding the two models, the validation process, and their performance in projecting air quality and evaluating the Spokane PM<sub>10</sub> emissions control strategy, is presented in Appendix K.

### **6.3 EXPECTED EMISSION LEVELS**

The projected annual emissions without controls for 1994 and 1997 were presented in Table 4.2. The projected 24-hour emissions without controls for 1994 and 1997 for each of the three "worst-case" scenarios were presented in Table 4.4. Table 6.4 below shows the expected annual PM<sub>10</sub> emission levels with and without controls for 1994 and 1997, and Table 6.5 shows the expected 24-hour emissions for each of the three "worst-case" scenarios with and without controls in 1994 and 1997. (Windblown dust emissions are excluded in each of these tables.) In each case the point source emissions represent allowable emissions, and maximum 24-hour allowable emissions were used by the model to come up with the expected 24-hour "worst-case" emissions for each scenario shown in Table 6.5 and to come up with the expected air quality levels presented in Section 6.4. The maximum 24-hour allowable emission rates for all of the point sources listed in Section 4.2 were derived from hourly allowable emission rates expressed in grams per second multiplied by the highest expected number of hours of operation in a day.

**Table 6.4**  
**EXPECTED 1994 AND 1997 ANNUAL PM<sub>10</sub> EMISSIONS WITH AND WITHOUT CONTROLS, EXCLUDING WINDBLOWN DUST**

CATEGORY	TONS PER YEAR			
	1994		1997	
	W/O	WITH	W/O	WITH
<b>POINT SOURCES:</b>				
Industrial/Commercial <sup>1</sup>	1,173	1,173 <sup>2</sup>	1,173	1,173 <sup>2</sup>
<b>AREA SOURCES:</b>				
Small Industrial/Commercial:				
Fuel Combustion	62	62 <sup>2</sup>	65	65 <sup>2</sup>
Incineration	3	3 <sup>2</sup>	3	3 <sup>2</sup>
Residential:				
Wood Fuel Combustion	1,513	1,462 <sup>3</sup>	1,535	1,483 <sup>3</sup>
Non-Wood Fuel Combustion	68	68 <sup>2</sup>	69	69 <sup>2</sup>
Outdoor Burning and Incineration	6	6 <sup>2</sup>	6	6 <sup>2</sup>
Transportation:				
Unpaved Road and Parking Lot Dust, etc. <sup>4</sup>	3,669	2,796 <sup>3</sup>	3,873	2,964 <sup>3</sup>
Paved Road Dust, etc. <sup>4</sup>	1,664	1,637 <sup>3</sup>	1,757	1,728 <sup>3</sup>
Aircraft	23	23 <sup>2</sup>	23	23 <sup>2</sup>
Railroad Locomotives	21	21 <sup>2</sup>	21	21 <sup>2</sup>
Other:				
Non-Road Mobile Sources	126	126 <sup>2</sup>	127	127 <sup>2</sup>
Wildfires	101	101 <sup>2</sup>	101	101 <sup>2</sup>
Structure Fires	34	34 <sup>2</sup>	34	34 <sup>2</sup>
Agricultural Field Burning	13	13 <sup>2</sup>	13	13 <sup>2</sup>
<b>TOTAL</b>	<b>8,476</b>	<b>7,525</b>	<b>8,800</b>	<b>7,810</b>

<sup>1</sup> The 1994 and 1997 Industrial/Commercial emissions shown are "allowable" emissions.

<sup>2</sup> No controls are being applied to these emission sources or no emission reduction credit is being claimed for existing controls.

<sup>3</sup> These reductions may appear insignificant, but as shown in Table 6.5, they include a significant reduction in the emissions that have contributed the most to exceedances.

<sup>4</sup> The word "etc." includes PM<sub>10</sub> from vehicle exhaust and brake and tire wear.

**Table 6.5**  
**EXPECTED 24-HOUR "WORST-CASE" EMISSIONS FOR EACH SCENARIO WITH**  
**AND WITHOUT CONTROLS, EXCLUDING WINDBLOWN DUST**  
**(IN TONS PER DAY)**

**Unpaved Roads Scenario**  
 (under 10/21/89 meteorological conditions)

SOURCE CATEGORY	PRE-1990 <sup>1</sup>	1994		1997	
		W/O	WITH	W/O	WITH
Unpaved Roads	6.96	8.12	7.52	8.61	7.97
Paved Roads	4.14	4.47	4.47	4.74	4.74
Res. Wood Combust.	10.33 <sup>1</sup>	3.90	0.78	3.96	0.79
Point Sources	2.57	2.57	2.57	2.57	2.57
Other	0.99	1.00	1.00	1.01	1.01
Totals	24.99	20.06	16.34	20.89	17.08

**Paved Roads Scenario**  
 (under 3/12/93 meteorological conditions)<sup>2</sup>

SOURCE CATEGORY	PRE-1990 <sup>1</sup>	1994		1997	
		W/O	WITH	W/O	WITH
Unpaved Roads	0	0	0	0	0
Paved Roads	16.56	17.88	5.36	18.96	5.69
Res. Wood Combust.	13.86 <sup>1</sup>	5.24	1.05	5.31	1.06
Point Sources	2.57	2.57	2.57	2.57	2.57
Other	0.99	1.00	1.00	1.01	1.01
Totals	33.98	26.69	9.98	27.85	10.33

**Residential Wood Combustion Scenario**  
 (under 1/21/87 meteorological conditions)

SOURCE CATEGORY	PRE-1990 <sup>1</sup>	1994		1997	
		W/O	WITH	W/O	WITH
Unpaved Roads	0	0	0	0	0
Paved Roads	4.14	4.47	4.47	4.74	4.74
Res. Wood Combust.	22.82 <sup>1</sup>	8.62	1.72	8.75	1.75
Point Sources	2.57	2.57	2.57	2.57	2.57
Other	0.99	1.00	1.00	1.01	1.01
Totals	30.52	16.66	9.76	17.07	10.07

- <sup>1</sup> The Pre-1990 residential wood combustion emissions are higher than those shown earlier for 1990 because the 1990 emission factors reflect a general decrease in emissions due to greater public awareness and proficiency in the use of wood stoves.
- <sup>2</sup> 1993 emissions were used for the paved roads scenario because they include traction materials, but they were reduced to 1989 levels, to represent a pre-1990 condition, by applying the appropriate growth factors in reverse.

#### **6.4 EXPECTED AIR QUALITY LEVELS FOR THE 24-HOUR STANDARD**

The 1994 and 1997 air quality levels, both with and without controls, as predicted by the dispersion models, are presented in this section. Two separate model applications are used to demonstrate attainment of the 24-hour standard. The first application uses 1985 to 1989 air quality data to predict the 1994 and 1997 air quality levels from all emission sources. However, because there was a lack of information regarding the contribution of paved road traction material emissions in the 1985 to 1989 data, a second application uses some "real time" air quality data from March of 1993 (which clearly shows the contribution of traction material emissions) to predict the 1994 and 1997 air quality levels from all emission sources including traction material. It should also be noted that both applications exclude windblown dust emissions.

In the first application of the models, all of the values presented represent the second highest concentrations predicted by the models. The second highest concentrations are used because:

- 1) Monitoring data from the Crown Zellerbach site is available for nearly every day beginning in November 1985 and continuing to the present;
- 2) The monitored concentration at the Crown Zellerbach site is generally the highest in the modelling domain;
- 3) All days in the four-plus year period when at least one of the Spokane monitoring sites measured a concentration of 120 ug/m<sup>3</sup> or greater were included in the data set; and
- 4) The National Ambient Air Quality Standard for PM<sub>10</sub> essentially allows one excursion above the standard per year without penalty.

In the second application of the models, all of the values presented represent the highest concentrations predicted by the models. The highest values are appropriate because only a small data set was used in the analysis of traction materials.

As is readily apparent in Figures 6.2 through 6.7, air quality models of the type used here tend to produce an unrealistic buildup of concentrations at down wind boundaries. This excess is only of concern for those cells within two grid lengths of the boundary. Therefore, the values displayed in these cells are biased and are not used to determine attainment in the following analyses.

The results of the first application of the models are shown in Figures 6.2, 6.3, and 6.4. Figure 6.2 shows the 1990 24-hour PM<sub>10</sub> air quality levels without controls

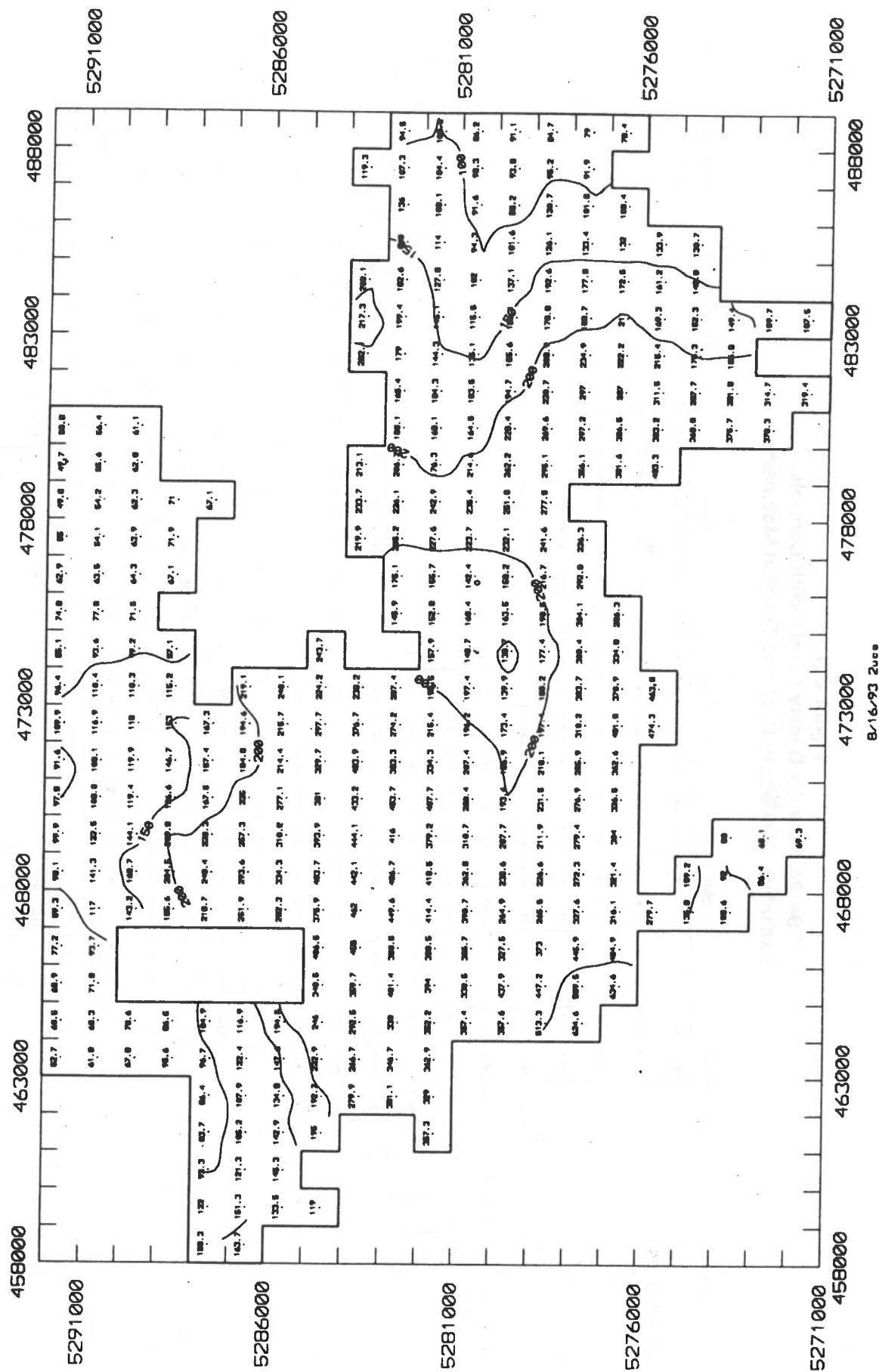
(excluding paved road traction material emissions). Figures 6.3 and 6.4 show the second highest expected 24-hour  $PM_{10}$  air quality levels with controls (excluding paved road traction material emissions) for 1994 and 1997, respectively.

The results of the second application of the models are shown in Figures 6.5, 6.6, and 6.7. Figure 6.5 shows the 1994 24-hour  $PM_{10}$  air quality levels without controls (including paved road traction material emissions). Figures 6.6 and 6.7 show the highest expected 24-hour  $PM_{10}$  air quality levels with controls (including paved road traction material emissions) for 1994 and 1997, respectively.

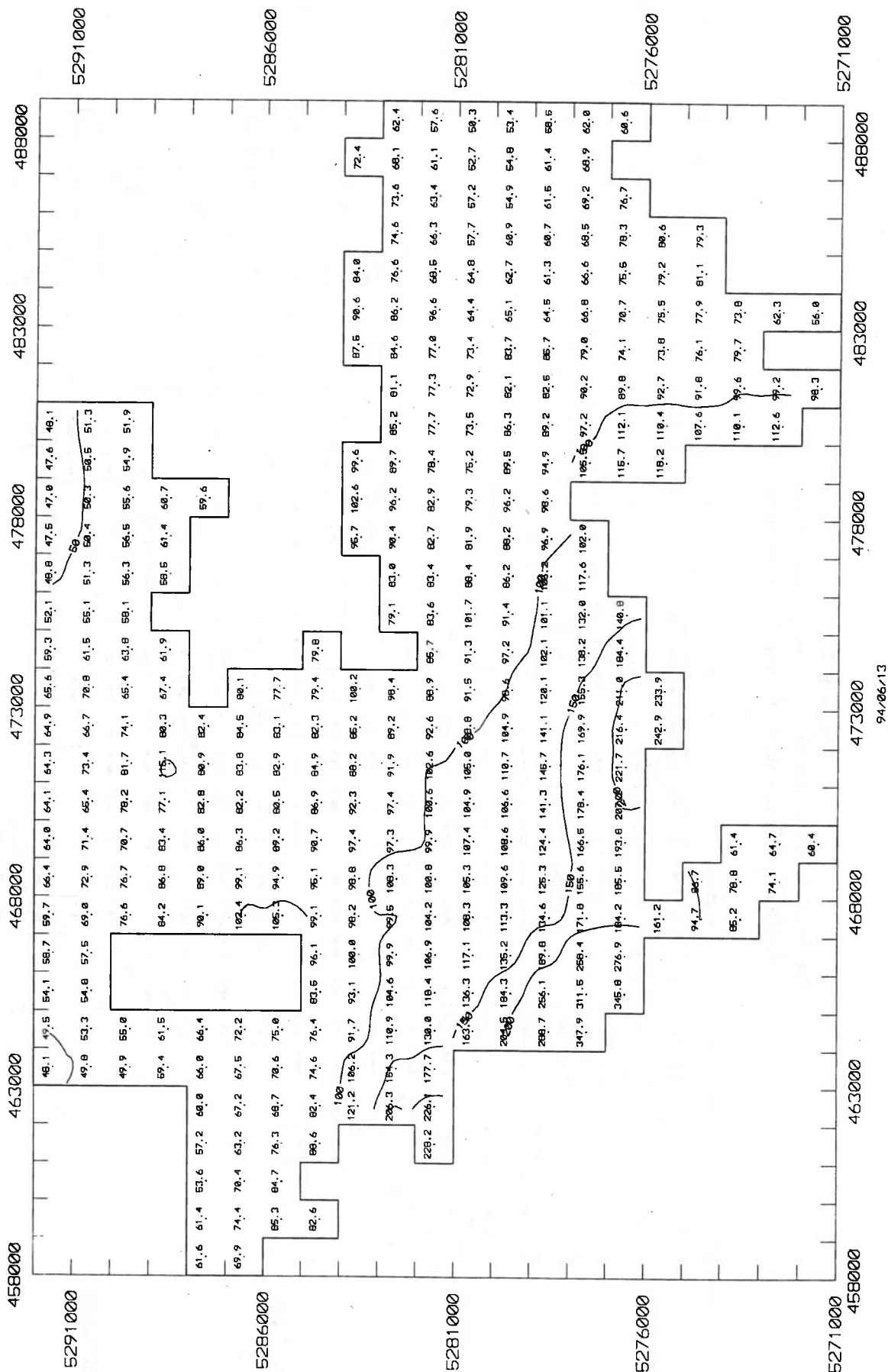
As shown in Figures 6.3 and 6.4, the Spokane  $PM_{10}$  nonattainment area will be in attainment of the 24-hour  $PM_{10}$  standard in 1994 and 1997, excluding windblown dust emissions and paved road traction materials, because the highest predicted second-high values of  $145.7 \text{ ug/m}^3$  for 1994 (in grid cell #231) and  $149.8 \text{ ug/m}^3$  for 1997 (in grid cell #231) are below the standard of  $150 \text{ ug/m}^3$ . (Although  $149.8 \text{ ug/m}^3$  is not far below the standard, it should be recognized that this value only applies to the unpaved roads scenario.)

As shown in Figures 6.6 and 6.7, the Spokane  $PM_{10}$  nonattainment area will also be in attainment of the 24-hour  $PM_{10}$  standard in 1994 and 1997 if paved road traction materials are included (but windblown dust emissions are not) because the highest predicted values of  $135.8 \text{ ug/m}^3$  for 1994 (in grid cell #227) and  $142.8 \text{ ug/m}^3$  for 1997 (in grid cell #227) are below the standard of  $150 \text{ ug/m}^3$ .

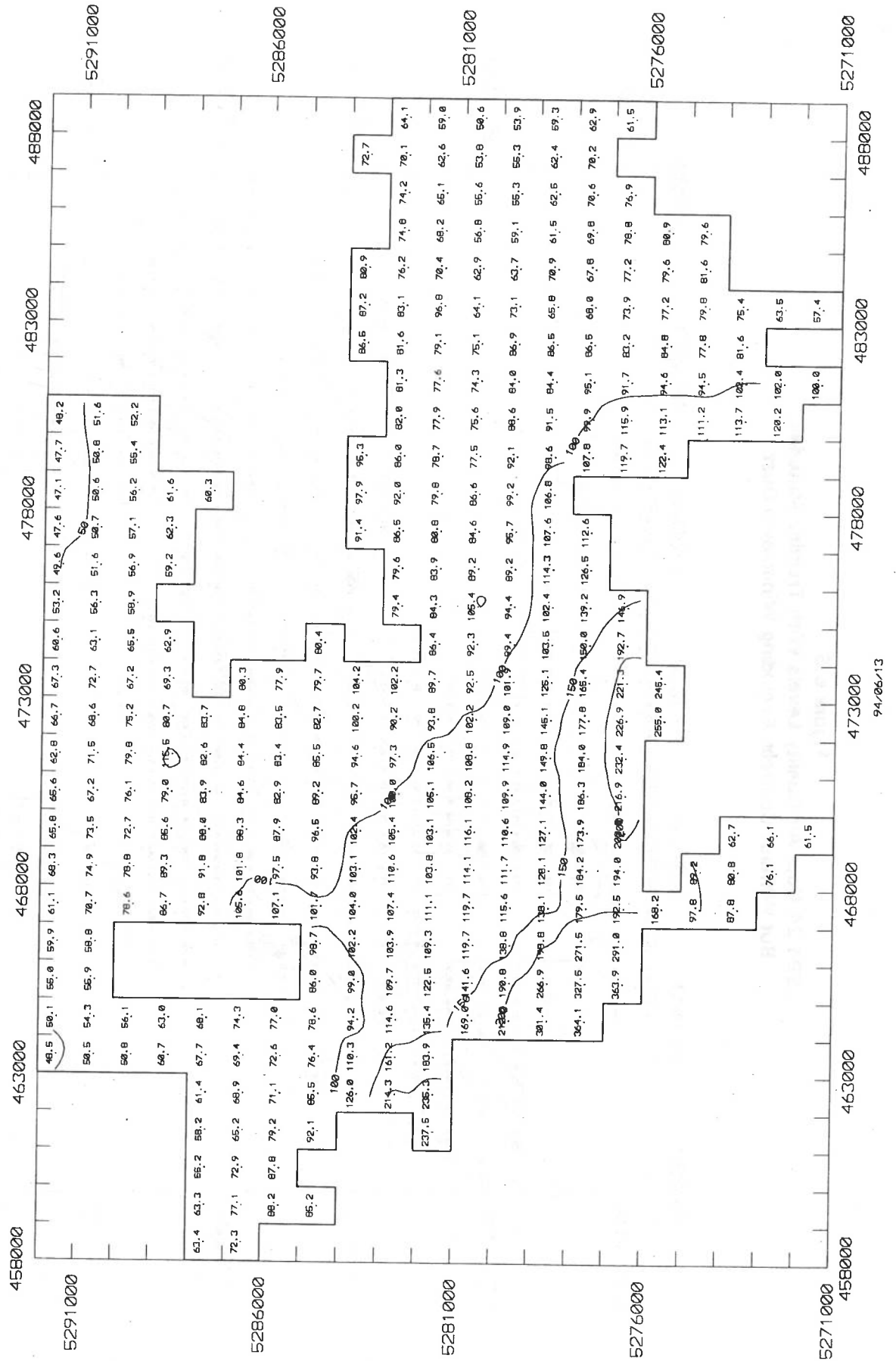
**Figure 6.2**  
**Pre-1990 24-Hour Air Quality Levels Without Controls,**  
**Excluding Windblown Dust and Traction Materials**



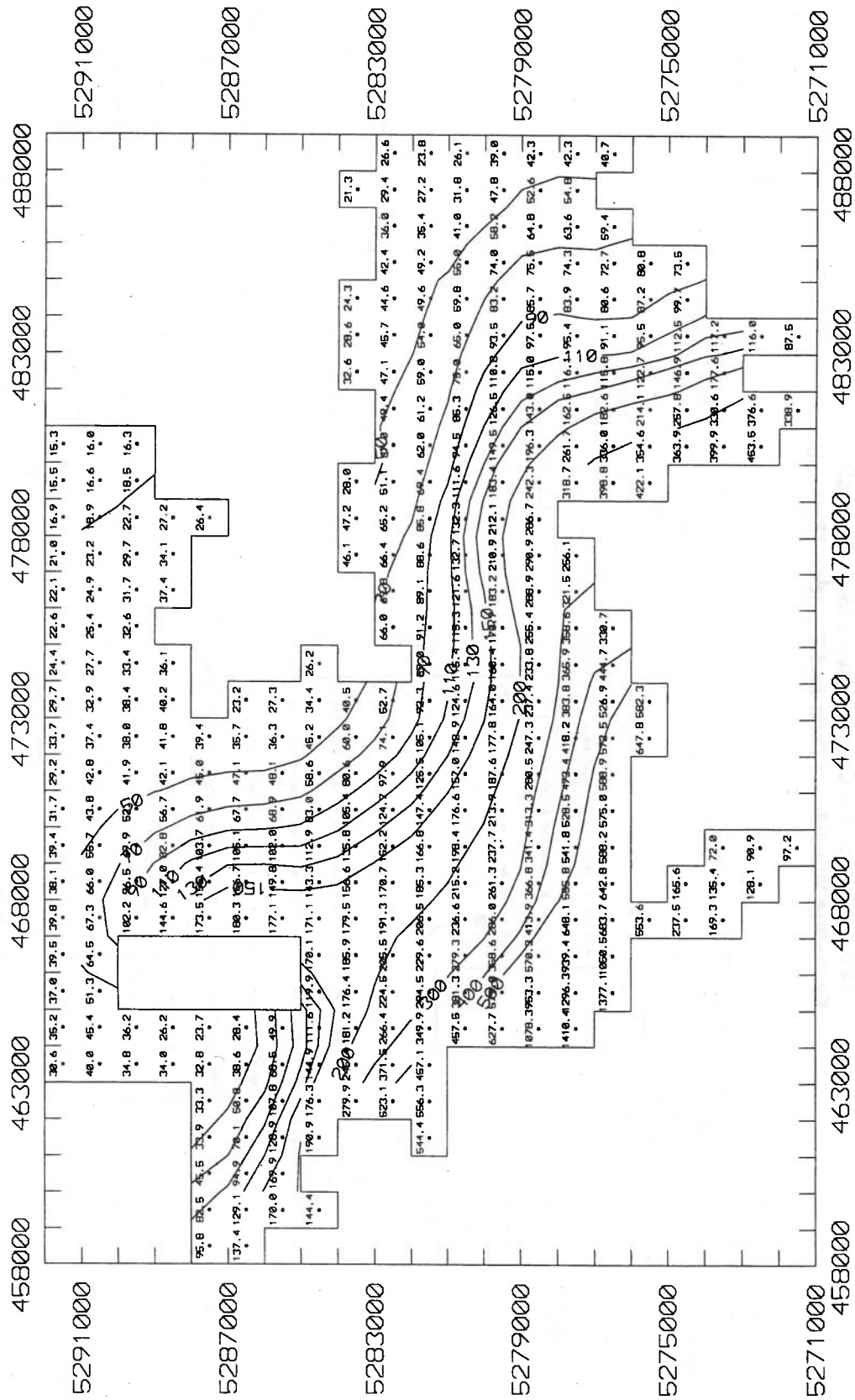
**Figure 6.3**  
**1994 24-Hour Air Quality Levels With Controls,**  
**Excluding Windblown Dust and Traction Materials**



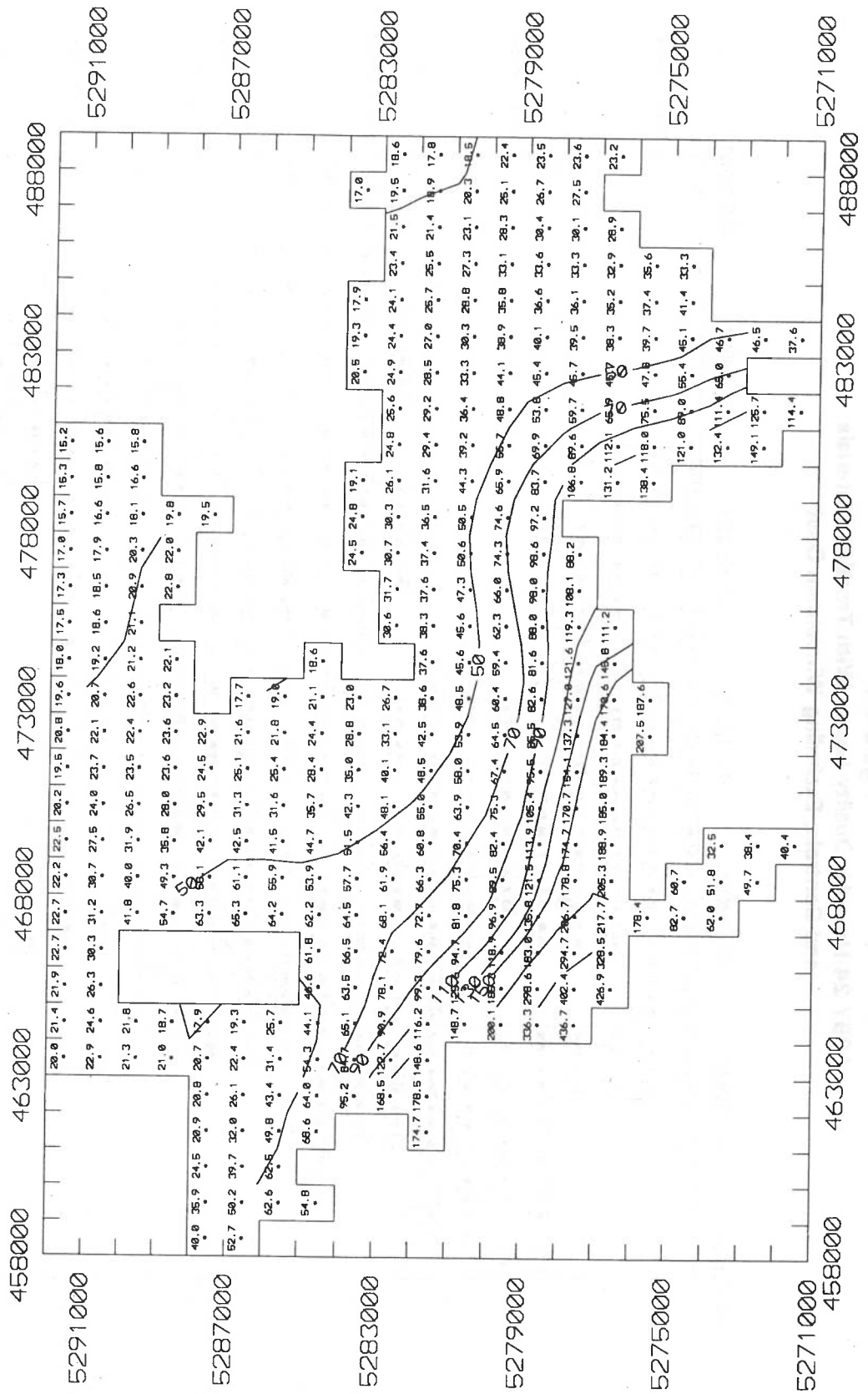
**Figure 6.4**  
**1997 24-Hour Air Quality Levels With Controls,**  
**Excluding Windblown Dust and Traction Materials**



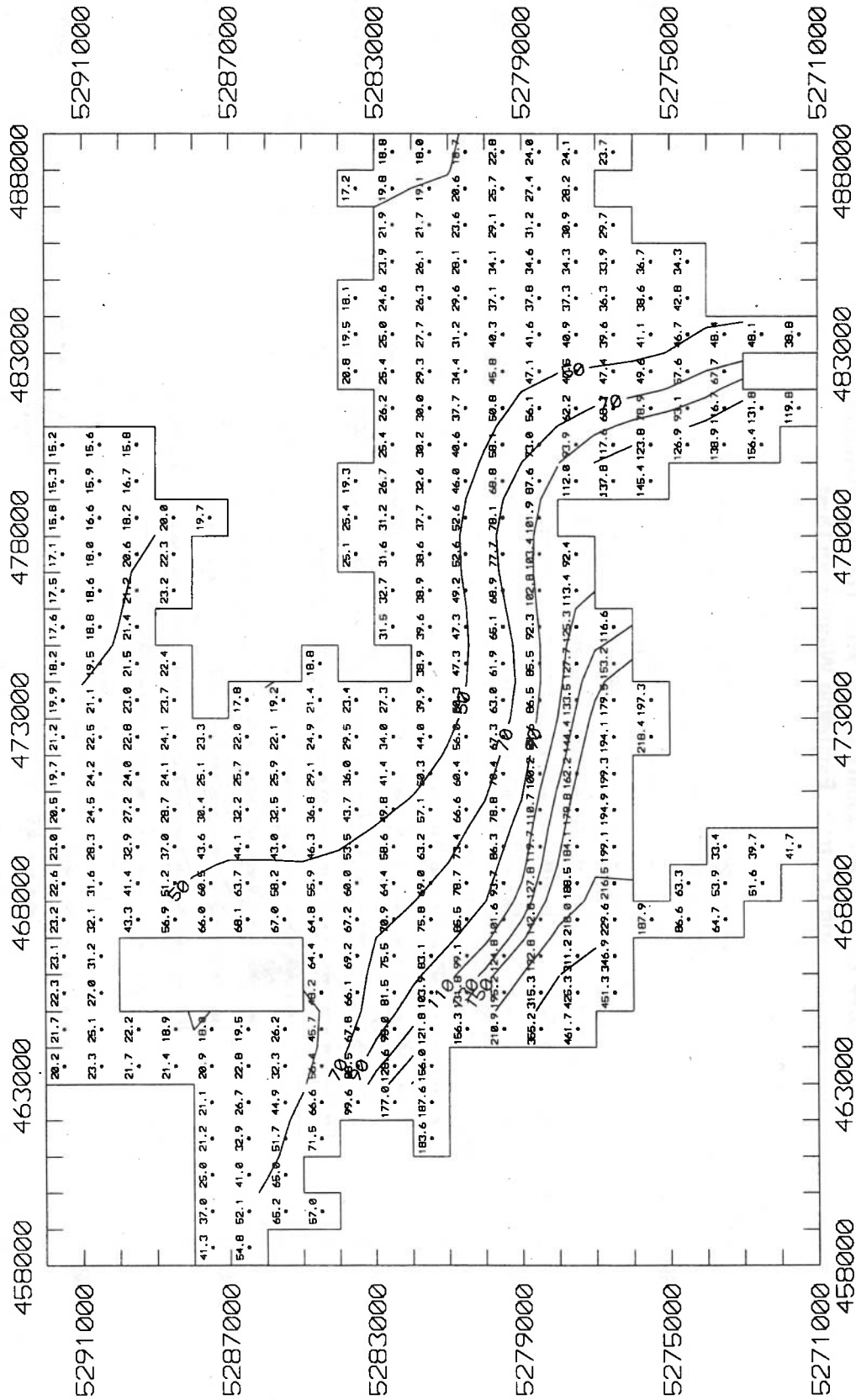
**Figure 6.5**  
**1994 24-Hour Air Quality Levels With Traction Materials**  
**But Without Controls, Excluding Windblown Dust**



**Figure 6.6**  
**1994 24-Hour Air Quality Levels With Traction Materials**  
**and Controls, Excluding Windblown Dust**



**Figure 6.7**  
**1997 24-Hour Air Quality Levels With Traction Materials**  
**and Controls, Excluding Windblown Dust**

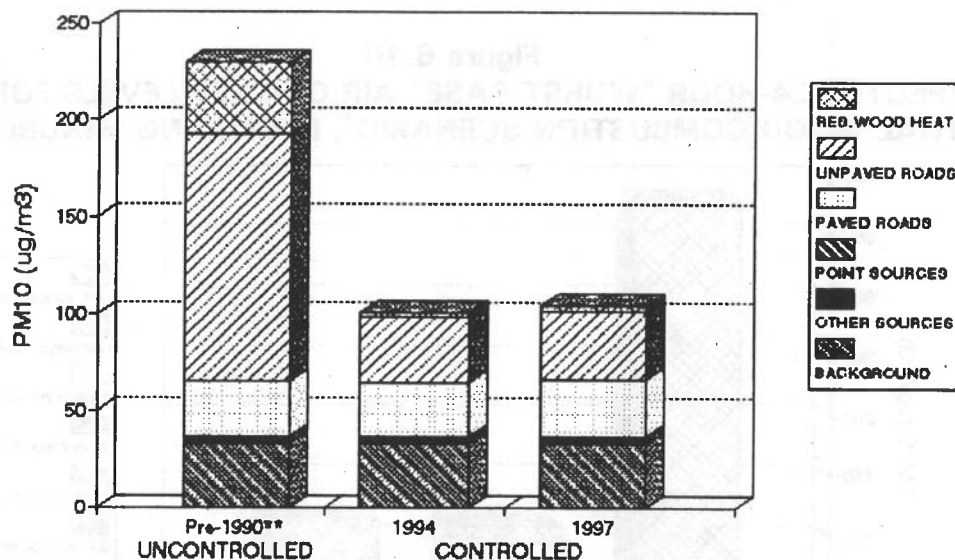


## 6.5 AIR QUALITY LEVELS FOR EACH 24-HOUR "WORST-CASE" SCENARIO

Figures 6.8, 6.9, and 6.10 illustrate how all of the various emission sources contributed to the pre-1990 24-hour air quality levels modelled for each of the three "worst-case" scenarios, excluding windblown dust. (Figure 6.8 illustrates the contribution of sources in the unpaved roads scenario, which resulted in the 231.6  $\mu\text{g}/\text{m}^3$  derived in the first application of the models as shown in model grid cell #230 in Figure 6.2. Figure 6.9 illustrates the contribution of sources in the paved roads scenario, which resulted in the 313.3  $\mu\text{g}/\text{m}^3$  derived in the second application of the models as shown in model grid cell #230 in Figure 6.5. And finally, Figure 6.10 illustrates the contribution of sources in the residential wood combustion scenario, which resulted in the 380.5  $\mu\text{g}/\text{m}^3$  derived in the first application of the models as shown in model grid cell #350 in Figure 6.2.)

Figures 6.8, 6.9, and 6.10 also show how the control strategy works to reduce the high pre-1990  $\text{PM}_{10}$  concentrations to healthful levels in each of the three "worst-case" scenarios in 1994 and 1997. In each case, the predicted values are below the 24-hour standard of 150  $\mu\text{g}/\text{m}^3$ .

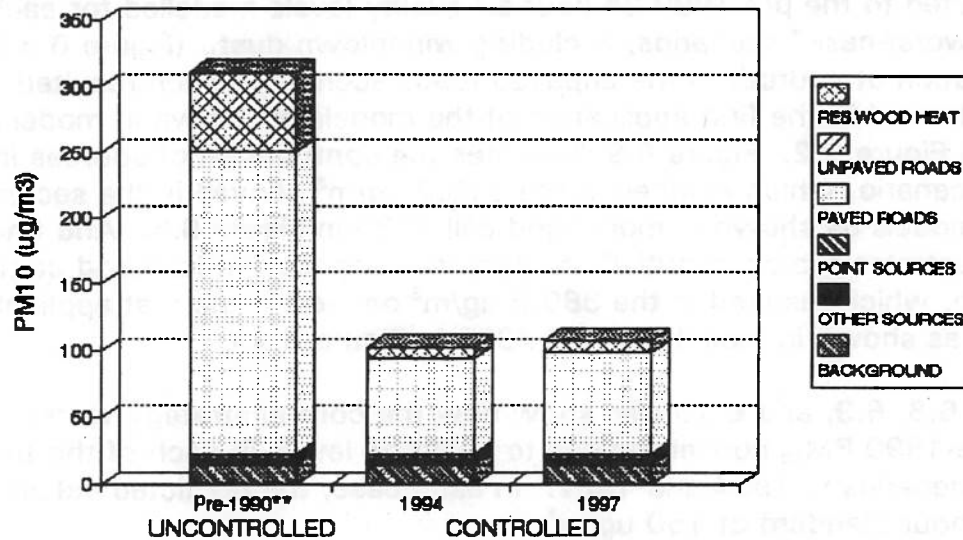
**Figure 6.8**  
**EXPECTED 24-HOUR "WORST-CASE" AIR QUALITY LEVELS FOR THE UNPAVED ROADS SCENARIO\*, EXCLUDING WINDBLOWN DUST**



\* The unpaved roads and parking lots scenario typically affects a limited urban area, and it generally occurs between September and November when soil moisture is low and there are cool, dry, stagnant, evening air conditions. The  $\text{PM}_{10}$  levels shown here are for model grid cell #230, and common 10/21/87 meteorological conditions were used for comparison purposes.

\*\* The contribution of residential wood combustion emissions was significantly reduced in 1990 when new emission factors were adopted for such emissions.

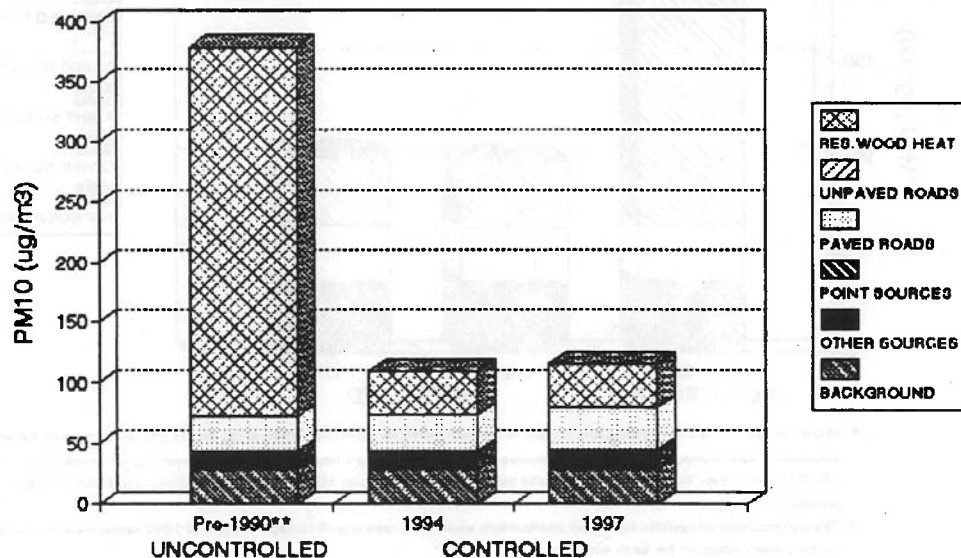
**Figure 6.9**  
**EXPECTED 24-HOUR "WORST-CASE" AIR QUALITY LEVELS FOR THE**  
**PAVED ROADS SCENARIO\*, EXCLUDING WINDBLOWN DUST**



\* The paved roads (traction material) scenario typically affects a broad urban area, and it generally occurs between February and March when roads with snow and traction material on them thaw and dry out and receive substantial vehicle traffic under stagnant air conditions. The PM10 levels shown here are for model grid cell #230, and common 3/12/93 meteorological conditions were used for comparison purposes.

\*\* The pre-1990 concentrations were derived by applying the appropriate growth factors to the 3/12/93 concentration in reverse and applying pre-1990 emission factors to the residential wood heat concentrations.

**Figure 6.10**  
**EXPECTED 24-HOUR "WORST-CASE" AIR QUALITY LEVELS FOR THE**  
**RESIDENTIAL WOOD COMBUSTION SCENARIO\*, EXCLUDING WINDBLOWN DUST**



\* The residential wood heat scenario typically affects a broad urban area, and it generally occurs between December and February during cold, stagnant air conditions. The PM10 levels shown here are for model grid cell #360, and common 1/21/87 meteorological conditions were used for comparison purposes.

\*\* The contribution of residential wood combustion emissions was significantly reduced in 1990 when new emission factors were adopted for such emissions.

## **6.6 EXPECTED AIR QUALITY LEVELS FOR THE ANNUAL STANDARD**

The highest expected annual  $PM_{10}$  air quality levels for 1994 and 1997 are presented in Appendix L. As shown in that appendix, the Spokane  $PM_{10}$  nonattainment area will be in attainment of the annual standard in 1994 and 1997 because the predicted values of  $44.9 \text{ ug/m}^3$  and  $46.6 \text{ ug/m}^3$ , respectively, are below the standard of  $50 \text{ ug/m}^3$ , even when windblown dust emissions are included in the annual average concentrations.

The expected air quality impacts for the aluminum standard are shown in Table 2.6-1. The impacts are based on the assumption that the aluminum standard will be achieved by the year 2000. The impacts are based on the assumption that the aluminum standard will be achieved by the year 2000. The impacts are based on the assumption that the aluminum standard will be achieved by the year 2000.